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There is now a worldwide effort to harness the power of quantum mechanics to perform computations more efficiently, communicate information more securely, and measure physical quantities with unprecedented precision. However, many basic questions remain unanswered, such as: From what physical objects should these new technologies be made? How complex of a system can we build while still being able to control and measure its quantum mechanical behavior? Is quantum mechanics even applicable beyond a certain level of complexity, all the way to macroscopic, everyday objects? This last fundamental question has intrigued physicists since the early days of quantum mechanics, as evidenced by Schrödinger's famous thought experiment about a cat in a box.

Yiwen Chu's research group at ETH Zürich is exploring these questions by building devices that combine different quantum systems and investigating the quantum mechanical behavior of massive, mechanical objects. One example of an experiment performed by the group with interesting implications for fundamental physics is the realization of a quantum superposition of mechanical vibrations in a 16-microgram crystal, making it the most massive object to exhibit such quantum behavior so far. The group also focuses on building hybrid quantum devices by using mechanical motion as an interface between diverse quantum objects, such as electronic circuits for performing computations and light for carrying information over long distances. In addition to being crucial building blocks for new technologies, such hybrid devices advance the frontiers of complexity in quantum systems, which is a long-term goal of Chu's research.